Original Research Article

COMPARATIVE STUDY ON COLOR STABILITY OF DENTURE RELINE POLYMERS WHEN USING MICROWAVE AND CHEMICAL DISINFECTION

ABSTRACT

This study investigated the color stability of reline resin after two methods of disinfection i.e microwave disinfection and chemical disinfection. A stainless steel mold with a breakaway compartment (10 mm in diameter by 0.7 mm thickness) was made to fabricate specimens of various resins. Each material was mixed according to manufacturer's instructions and applied into the mold. Prior to color stability testing, specimens were cleaned in distilled water for 20 minutes to kill any microorganisms that may had contaminated the discs during fabrication. And then specimens were immersed in Sodium Perborate Monohydrate 200 ml of solution for 15 days and microwaved for 15 days so that it is comparable to chemical disinfection soaking. The color stability of each specimen was measured again using spectrophotometer and values were obtained. The data of ΔE, ΔL, Δb, Δa were analysed by 2 way repeated measures ANOVAs test. Significant statistic changes in color parameters ΔL, Δa, Δb of the reline resin DPI, Ufi Gel Hard And Kooliner were observed when dentures were disinfected by Sodium Perborate Monohydrate 2% solutions. The color stability of the reline resin was influenced by time, regardless of disinfection or non disinfection. The color stability deviation value ΔE significantly increased to maximum for chemical disinfectant, least for Control group and intermediate for microwaved group. Ufi Gel showed the highest deviation ΔE and Control Group showed the lowest deviation according to results.

Keywords: Color stability of reline resin, microwave disinfection; chemical disinfection; spectrophotometer; dentures; sodium perborate.

1. INTRODUCTION

The fit of dentures continuously break down with time in the supporting tissue. Hard chairside reline resins are utilized for transitory or lasting enhancement of denture fit .Schou et al and Blair et al. commented that denture stomatitis was a common condition among elderly and was related to continuous denture wearing and poor hygiene [1]. Continuous swallowing or aspiration of microorganisms from dental plaque, which may deteriorate the oral health of patient(5). Dental prostheses brought into a dental office for relining or modifications are sullied with pathogenic microorganisms [2]. Concern about transmission of these organisms between the workplace and research facility has prompted restored enthusiasm for sanitization and disinfection [3]. Current built up strategies have not been ended up being totally viable in averting or taking out the event of denture stomatitis [4]. Therefore, elective sterilizing techniques are being sought after, including the utilization of microwave energy and chemical disinfection. Microwave energy has been prescribed for cleaning complete dentures to counteract or treat denture stomatitis and to control cross-contamination. Albeit chemical disinfection has been generally suggested, it is conceivable that specific parts of the disinfectant arrangements may infiltrate the material and not be totally disposed of by rinsing [5]. Esthetics is an important aspect in denture relining as color of relining material and denture base should match [6]. Despite the wide utilization of both the materials for purification, no similar investigation between the previously mentioned two techniques has been done [7]. However, past examinations have not been reliable or express regarding the approach utilized.

2. METHODOLOGY

This *in vitro* study was conducted to compare the Color Stability of Denture Reline Polymers using Microwave and Chemical Disinfection. A stainless steel mold with a breakaway compartment (10 mm in diameter by 0.7 mm thickness) was made to fabricate specimens of various resins.(ADA specification no. 19). 10 specimens of each resin were prepared under aseptic conditions. Each material was mixed according to manufacturer's instructions and applied into the mold, which were placed on an acetate sheet and glass slab was placed over the material, and light pressure was applied to remove the excess material from the mold. Specimens were divided into three test groups.

Fig. 1. Stainless Steel Die (ADA Specification no. 19)

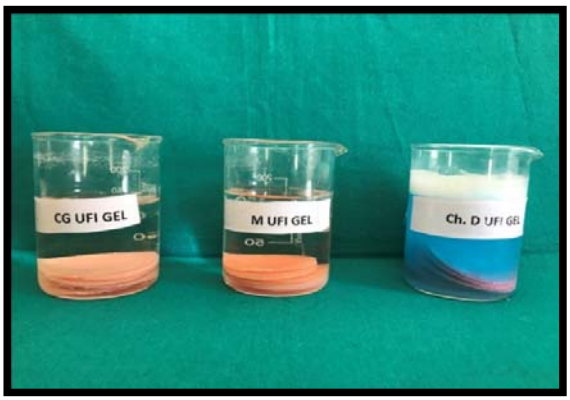

Fig. 2. Example of Grouping of Sample of each material

Table 1: Grouping of Samples according to material used.

GROUP	MATERIAL USED
G1	Kooliner Sample
G2	Ufi Gel Hard Sample
G3	DPI Sample

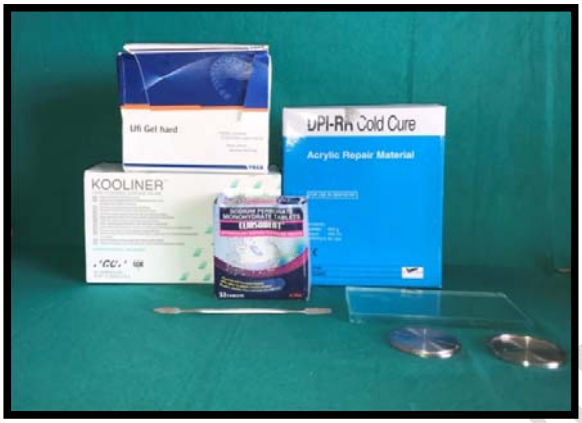

Fig. 3. Materials used, die and armamentarium

Table 2: Grouping of Samples according to Microwave disinfectant method used.

GROUP	Non Microwaved	Microwaved
G1 (Kooliner)	Control Group G1C	Microwaved Group G1M
G2 (Ufi Gel)	Control Group G2C	Microwaved Group G2M
G3 (DPI)	Control Group G3C	Microwaved Group G3M

Table 3: Grouping of Samples according to Chemical Disinfectant method.

GROUP	Chemical Disinfectant
Kooliner G1	Chemically disinfected G1D
Ufi gel G2	Chemically disinfected G2D
DPI G3	Chemically disinfected G3D

Prior to color stability testing, specimens were cleaned in distilled water for 20 minutes to kill any microorganisms that may had contaminated the discs during fabrication. And then specimens were immersed in Clinsodent (Sodium Perborate Monohydrate) 200 ml of solution for 15 days. In test group (G1C, G2C, G3C) Specimens were submitted to daily chemical disinfection by immersing into 3.8% Sodium Perborate Monohydrate solution for 15 days and for each soaking, fresh Sodium Perborate Monohydrate solution was used and distilled water was changed daily. The microwave cycles were also repeated for 15 days, so that period of chemical disinfection was comparable with that of microwave disinfection and control groups.

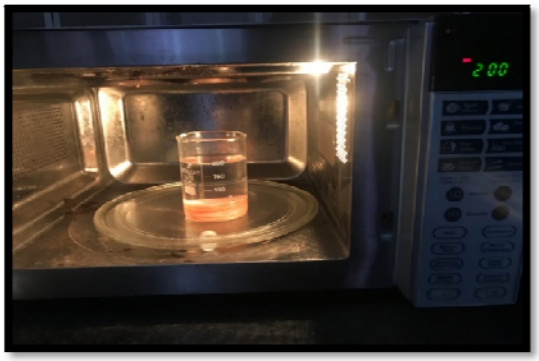

Fig. 4. Sample placed in microwave for 2 min at 430 W

The color stability of each specimen was measured again using spectrophotometer and values were obtained. The data of ΔE, ΔL, ΔB, Δa were analysed by 2 way repeated measures ANOVAs test.

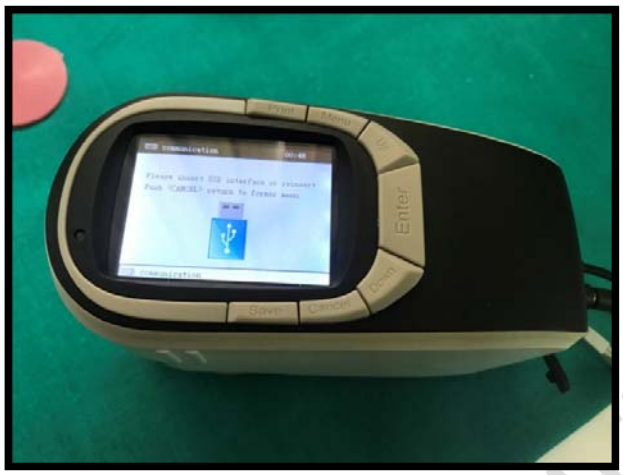

Fig. 5. Spectrophotometer Color Guide 45/0 used for Sample testing

All the procedure were done by single operator to avoid any bias. All the experimental groups were then examined under spectrophotometer according to the CIE L*A*B* color order system of Commision International Del' Eclairage.

3. RESULTS

For DPI Group Descriptive statistics of different colour stability parameters (ΔL, Δa, Δb and ΔE) were attained in Control group, microwave treatment and chemical treatment at 15th day after immersion with DPI. All parameters appeared significant when compared across control, chemical and microwave group. Chemical disinfectant and Control group showed the highest and lowest deviation respectively. In case of Kooliner Group the value as compared with control were non-significant. Other multiple comparison values were found significant .Chemical disinfectant and Control group showed the highest and lowest deviation respectively. For UFI Gel hard Group chemical disinfectant and control group showed the highest and lowest deviation respectively. Significant statistic changes in color parameters ΔL, Δa, Δb of the reline resin DPI, Ufi Gel Hard And Kooliner were observed when dentures were disinfected by Sodium Perborate Monohydrate 2% solutions. Significant statistic changes in color parameters ΔL, Δa, Δb of the reline resin DPI, Ufi Gel Hard And Kooliner were also observed when dentures were microwaved. The color stability of the reline resin was influenced by time, regardless of disinfection or non disinfection. Significant statistic changes in color deviation ΔE was observed for both the treatment i.e Microwaved and Chemical Disinfectant. The color stability deviation value ΔE significantly increased maximum for chemical disinfectant, least for Control group and intermediate for microwaved group. The results showed that microwaved specimens have higher color change than specimens did not microwave after 15 days of time interval. Ufi Gel showed the highest deviation ΔE and Control Group showed the lowest deviation according to results.

4. DISCUSSION

Prostheses debased with pathogenic microorganisms fill in as a potential wellspring of contamination transmission among patients and dental staff. To avoid cross-defilement, prostheses ought to be totally purified before being sent to the research center and before insertion [5, 7]. Several techniques for cleansing have been prescribed to guarantee disease control in dental practice. Many people do not clean their dentures satisfactorily and may misuse chemical cleansers leading to the deterioration of acrylic dentures. This in vitro assessed the color stability of Kooliner GC, UFi Gel hard and DPI when drenched in chemical disinfectant (Sodium Perborate monohydrate), when microwaved as compared with immersion in water at different intervals of time. The invalid speculation that there would be no impact of denture chemical and microwave sterilization on shading security of relining material was rejected. , there was a perceptible color stability change in control group with time. ΔL displayed a huge diminishing after some time for Control aggregate, which shows a fading (brightening) impact of reline material. Discoloration of resin based materials may be caused by intrinsic or extrinsic factors. Intrinsic factors are related to internal alterations in material resulting from physicochemical reactions or residual monomer oxidation [2]. Thus the initiator, quantity and type of

monomer and the polymerisation efficiency may affect the color stability of resin based materials. Furthermore, extrinsic factors that may influence the color change include adsorption and absorption of pigments. The increase of color change of the UFI gel could be attributed to the concentration of sodium perborate monohydrate used in this study. Therefore, further studies should consider the evaluation of other concentrations. The susceptibility to color change of the resin UFI gel, Kooliner and DPI evaluated in this study could be attributed to both intrinsic and extrinsic factors.According to Ufi Gel showed the highest ΔE with time and It was also noticed that Chemical disinfectant showed the highest ΔE and Control group the lowest. The results of present study are in agreement with these findings. The increase of color change of the UFI gel could be attributed to the concentration of sodium perborate monohydrate used in this study. Therefore, further studies should consider the evaluation of other concentrations. The degree of water absorption and hydrophilic of the relining material may explain their lower color stability as a function of time. The color stability of the reline resin was influenced by time, regardless of disinfection or non-disinfection. This could be credited to extraneous components like water assimilation and adsorption and furthermore to hydrophilic nature of material and characteristic variables which cause inner adjustments in material coming about because of physicochemical responses or lingering monomer oxidation Although the disinfectant arrangements utilized in this examination have been shown for denture biofilm control, patients ought to be educated concerning the likelihood of reline materials recoloring in long haul, paying little mind to the utilization or not of disinfectant arrangements. Hence, concluded that microwave disinfection method should be considered a better method for disinfection as compared to Chemical disinfection because of absence staining agent present. Chemical disinfection may have accelerated the content of residual monomer, which took place with time .Although the disinfectant solutions used in this study have been indicated for denture biofilm control, patients should be advised of the possibility of reline materials staining in long-term, regardless of the use or not of disinfectant solution and microwave method of disinfection.

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